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ABSTRACT

In order to study signs of stress in speech directed to children at risk for abuse, sentences matched on content were collected from audio recordings of adult-child interactions. The children were audiotaped during an unstructured interaction with both their own mother and an unrelated mother. A total of 40 sibling pairs, each including one sibling who was at relatively greater risk for abuse, were drawn from families involved in counseling. It was predicted that the interactions involving the child at greater risk would be perceived as more stressful by both maternal groups, and the prosodic features of the adult's voice would illustrate the heightened stress they experienced. In 61 of the interactions, the adult spontaneously uttered the target sentence: "I don't know." Among related mothers, 20 target utterances were directed to the more difficult child and 18 to the other child. Among unrelated mothers, 10 target utterances were directed to the difficult child and 13 to the other. Sentences were acoustically analyzed in terms of the speaker's mean fundamental frequency (MFF) level, MFF range, and MFF variability. Analysis revealed that for both unrelated and related mothers, speech directed toward children at greater risk for abuse was characterized by higher MFF, wider range, and larger MFF variability. (RH)

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Speech to children at risk for abuse:

An acoustical analysis

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Running Head: Speech to children at risk

Abstract

In order to study signs of stress in speech directed to children at risk for abuse, sentences matched in terms of their content were isolated from audio recordings of adult/child interactions. The children were audio taped during an unstructured interaction with both their own mother and an unrelated mother. 40 sibling pairs (one of whom was at relatively greater risk for abuse) were drawn from families involved in counseling. It was predicted that the interactions involving the child at greater risk for abuse would be perceived as more stressful by both maternal groups, and the prosodic features of the adult's voice should illustrate the heightened stress they experienced. Within 61 of the interactions, the adult spontaneously uttered the target sentence ("I don't know"). These sentences were acoustically analyzed in terms of the speaker's mean fundamental frequency (F_o) and range and variablity of their F_o. The analysis revealed that for both the unrelated and related mothers, speech directed towards children at greater risk for abuse was characterized by higher F_o, wider range and larger F_o variability.

Speech to children at risk for abuse:
An acoustical analysis

The interaction between children and their caretakers has become a major focus of research involving the socialization process. While parents play a large role in the growing process, recently social developmentalists have recognized the importance of the child's own characteristics on this two-way system. Socialization is viewed as a result of a pattern of reciprocal influence, running not only from the parent to the child but also from the child to their caregiver (Bell, 1979).

Child characteristics and their possible effects have received increasing attention in the context of the multiple reciprocal influences present in abusive families (e.g., Belsky, 1984; Burgess & Conger, 1978). Children at risk for abuse have been observed to possess a variety of traits such as prematurity (Elmer & Gregg, 1967), physical and learning disabilities (de Lissovoy, 1979), and mature facial features (McCabe, 1984). In addition, they were more likely to have medical problems and in some cases these problems precede later incidents of parental abuse (Sherrod,

O'Connor, Vietze, & Altemeier, 1984). The possession of these difficult characteristics places further strain on the caregiving system, and the parent's beliefs regarding the cause of the stress may determine whether the adult reacts in a positive or negative way to the child (Bugental, Mantyla, & Lewis, 1989).

The present study investigated patterns of interaction between children at risk for abuse and adults. Of interest here are signs of stress detected in the acoustical patterns of the adult's speech that may be related to difficult child behaviors. Upward changes in the level and variability of fundamental frequency (F_0) have been found to correlate with higher levels of stress in speakers (Williams & Stevens, 1972; Streeter, MacDonald, Apple, Krause, & Galotti, 1983). Measures of F_0 may also act as a cue to changes in one's emotional experience and physiological arousal (see Scherer, 1986, and Frick, 1985, for a review of the pertinent literature). Acoustical measures, in general, are attractive in that they offer a non-reactive yet high yield method of assessing a person's emotional state. If the characteristics of a difficult child do act as a strain on the caregiving system, the

higher stress felt by the parent should be reflected in acoustical measures of their voice recorded during an interaction.

In order to study this hypothesis, appropriate speech samples from parent-child interactions need to be isolated. As part of a larger project (Bugental, Blue, and Lewis, 1989), 40 familes participating in counseling were asked to take part in the research investigating interactional patterns in abusive families. Mothers were asked to interact individually with two of their children (matched as closely as possible in terms of age and gender) in an unstructured setting. In each of the pairs, one child was categorized as relatively "difficult" in comparison to their sibling. These children were not only perceived as harder to get along with by their mothers but were also more likely to be the target of more frequent and severe punishment. Differences in the mother's interactional behavior during their conversations with the two children could then be connected to the perceived child difficulty. In addition, unrelated mothers were also asked to interact with the same children. In this way, the change in stress due to the

child's behavior could be assessed in adults who had no previous contact with the children, controlling for the influence of interaction history.

During unstructured conversations, a variety of messages can be produced by the participants and content varies widely between dyads. Some sentences do occur frequently in conversations, and from these matched messages, a comparison between dyads can be made. One such message is "I don't know", a rather generic statement that occurs frequently in conversations between strangers and acquaintances. In the present study, this target sentence occurred in 61 out of the 160 total interactions, making it a good choice for the basis of our acoustical analysis. If the difficult child behaviors do act to increase the strain on a relationship, evidence of higher stress levels should be present in the sample messages recorded during conversations between the "difficult" child and mothers.

Method

Overview

The project is divided into two separate but parallel studies. In the first study, a comparison is

made between the speech samples of the natural mothers recorded during conversations with their two children. In the second study, the samples are from interaction involving the same children paired with unrelated mothers. The subjects (natural and unrelated mothers, difficult and comparison children) were drawn from a larger pool of 80 mothers (40 natural and 40 unrelated) and 80 children (again, 40 of each) used in the research described in Bugental et al. (1989). Their inclusion in this analysis is based on whether the target sentence was said during their interaction. The descriptions of the subjects that follows reflects only those used in the present analysis. A detailed description of the entire subject population in the larger project is available in Bugental, Blue, and Cruzcosa (in press).

Subjects

Natural Mothers. The families used in the project were recruited from a non-profit agency that provides services to abusive families and families seeking help with parenting skills. All the families were enrolled in counseling at the agency, and of the 41 mothers asked, 40 agreed to participate in a recorded

interaction. The mothers were reimbursed $20 for their trouble and participation was voluntary. In the sample used for the present study, all of the mothers were white, spoke English as their first language, and had an average of 13.2 years of education (s.d. = 2.7). In the 40 natural mother-difficult child dyads, 20 occurrances of the target sentence were identified (when the target was found more that once in a given dyad, one message was randomly chosen to represent that dyad). Within the 40 natural mother-other child dyads, 18 "I don't know" statements were recorded.

Unrelated mothers. The sample of unrelated mothers consisted of 40 women recruited from the community by publicly-placed advertisements in newspapers and laundry rooms, and all were paid $20 to participate. All mothers spoke English as their first language and were white. Their mean education level was 16.3 years (s.d. = 3.2). All of these mothers had at least one child between the ages of 4 and 12, and their mean number of children was 2.7 (s.d. = 1.3). In the 40 unrelated mother-difficult child dyads, 10 occurrences of the target sentence were identified, while in the 40 unrelated mother-comparison child dyads, 13 "I don't

know" statements were recorded.

Difficult and Comparison Children. In the larger study, each family had at least two children between the ages of 4 and 13 years (mean number of children in each family = 2.7; s.d. = 0.7). Two children were selected from each family, and child difficulty ratings were obtained for each. The child classified as the "difficult" sibling was the one that (a) received more frequent or more severe discipline as measured by the Conflict Tactics Scale (Straus, Gelles, & Steinmetz, 1980) and also (b) was rated as more difficult by the mother[1]. In families with more than two children, an effort was made to select those that were more similar in terms of age and gender. In the analyses using the natural mother's speech, children ranged in age from 4 to 13 years old. Mean age of the difficult group was 8.4 (s.d. = 3.19); mean of the comparison group was 7.78 (s.d. = 3.06). The difficult child group consisted of 19 boys and 1 girls, while the less difficult group was made up of 10 boys and 8

1. In cases where the two measures of difficulty were in conflict, the opinion of the family's counselor was used to determine the classification.

girls. For the analysis using the unrelated mother's speech, children ranged in age from 4 to 13 years old. Mean age of the difficult group was 8.0 (s.d. = 3.23); mean of the comparison group was 7.46 (s.d. = 2.53). The difficult child group consisted of 9 boys and 1 girls, while the less difficult group was made up of 8 boys and 5 girls. Although there was an uneven distribution of gender across the groups in both sets of analyses, sex was not included as a factor as there were too few "difficult" girls represented in the sample. Therefore conclusions can not rule out the possiblity that gender may have a significant effect.

Procedure

The dyads were individually audio-taped as the children interacted separately with their own mother and an unrelated mother (the order was randomly determined). The conversations took place in a comfortably furnished room with the participants seated in chairs a few feet from each other. Microphones were placed in the ceiling above the interactants and also in a plant located midway between the two chairs. The children would enter the room where the adult was waiting and both were instructed to "talk to each

other" while they waited to play a game. These unstructured interactions lasted four minutes, followed later by a structured "game" interaction and then the conversation with the other adult (see Bugental, et al., 1989, for a complete description of the procedure). After the recording was complete, the conversation from the unstructured interaction was replayed to identify occurrences of the target message ("I don't know"). All of the target samples were then copied onto a separate tape and digitally stored on a computer for later analysis.

The fundamental frequency patterns were then analyzed using the ILS speech analysis system (Signal Technologies, 1983). The program uses a Linear Predictive analysis to extract the acoustic parameters from a digital record of a speech sample. After analysis was complete, the mean fundamental frequency level, range and variability were available for comparison between the groups. In all, 61 adults said the target sentence during the interaction, with 38 of the messages from the related mothers (20 to the more difficult child, 18 to the other child) while 23 messages were taken from the unrelated mothers (10 to

the difficult child and 13 to the other child).

Results

A multivariate analysis of variance was used to test differences on three dependent measures: mean F_o level, F_o range, and F_o variablity. The analysis was repeated for both groups of mothers (natural and unrelated) using child difficulty as the independent measure.

Insert Table 1 about here

The results of the acoustical analysis show that for both related and unrelated mothers, the mean F_o level of the target message was significantly higher when talking to the difficult child (F (1, 36) = 6.00, p = .019 for the natural mothers; F (1, 21) = 9.03, p = .007 for the unrelated mothers). As predicted for the

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Insert Figure 1 about here

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unrelated mothers, F_o variability was also higher when speaking to the difficult child (F (1, 21) = 4.45, p = .047), while F_o range showed a trend towards the

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Insert Figure 2 about here

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predicted patterns (F (1, 21) = 3.49, p = .076). However, the range and variablity of the natural mother's F_0 did not show a significant difference.

Insert Figure 3 about here

Discussion

The higher level (and, to some extent the larger variability) of the target message fundamental frequency is believed to be a sign of higher stress in both the natural mothers (who have a long history of interactions with the children) and the unrelated mothers (who are illustrating this difference during their first conversation with the difficult child). Taken together, this observed difference supports the belief that conversations with "difficult" children are more stressful, and that this may be a result of differences in the child's behavior. Specific characteristics in abused children do place a strain on the caregiving system (de Lissovoy, 1979), and these

characteristics may play a role in the child's eventual development. These results do not suggest, however, that there is a direct connection between the child characteristics and the later occurrence of abuse. Difficult behaviors by themselves can not explain the patterns of interactions observed in abusive families. The role that these characteristics play must be viewed in context with other important influences, namely parental characteristics and other factors present in the child's environment.

Bugental and her colleagues (Bugental & Shennum, 1984; Bugental et al., 1989) propose a transactional model of caregiving interactions where child characteristics do not have a direct causal influence on behavioral outcomes, but instead interact with the causal beliefs of the adult. The parent's belief systems will influence the perceptions of a child's behaviors and act to amplify or attenuate the implications of the child's actions. Bugental et al. (1989) demonstrated that adults with low levels of perceived control over caregiving outcomes react with negative affect when confronted with difficult child behaviors. This reaction then leads to the maintenance

of the difficult child behaviors and further negative reactions from the adult. Eventually, the ineffective behavior could be replaced by abusive reactions to the child if the difficult behavior continued.

Due to the limited sample in the present project, the causal belief systems of the adults could not be included in the analysis. In future research, larger samples and/or a more controlled situation might yield support for the moderating influence of adult cognitions as well as evidence of strong child effects. In addition, other acoustical parameters, such as voice perturbations (Lieberman, 1961), measures of spectral energy (Scherer, 1986), and vocal quality (Laver, 1980), could be used to describe the nature of speech to children at risk for abuse. Further investigations might clarify patterns of influence and causative factors mediated in the interactional behavior observed in abusive families.

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Natural Mothers

Child Status	Dependent Measures: Fo mean	Range	Variance
Difficult	228.61	93.6	859.85
Other	192.42	72.5	588.62

Unrelated Mothers

Child Status	Dependent Measures: Fo mean	Range	Variance
Difficult	241.38	106.50	1846.4
Other	199.23	68.61	301.97

Table 1. Group Means

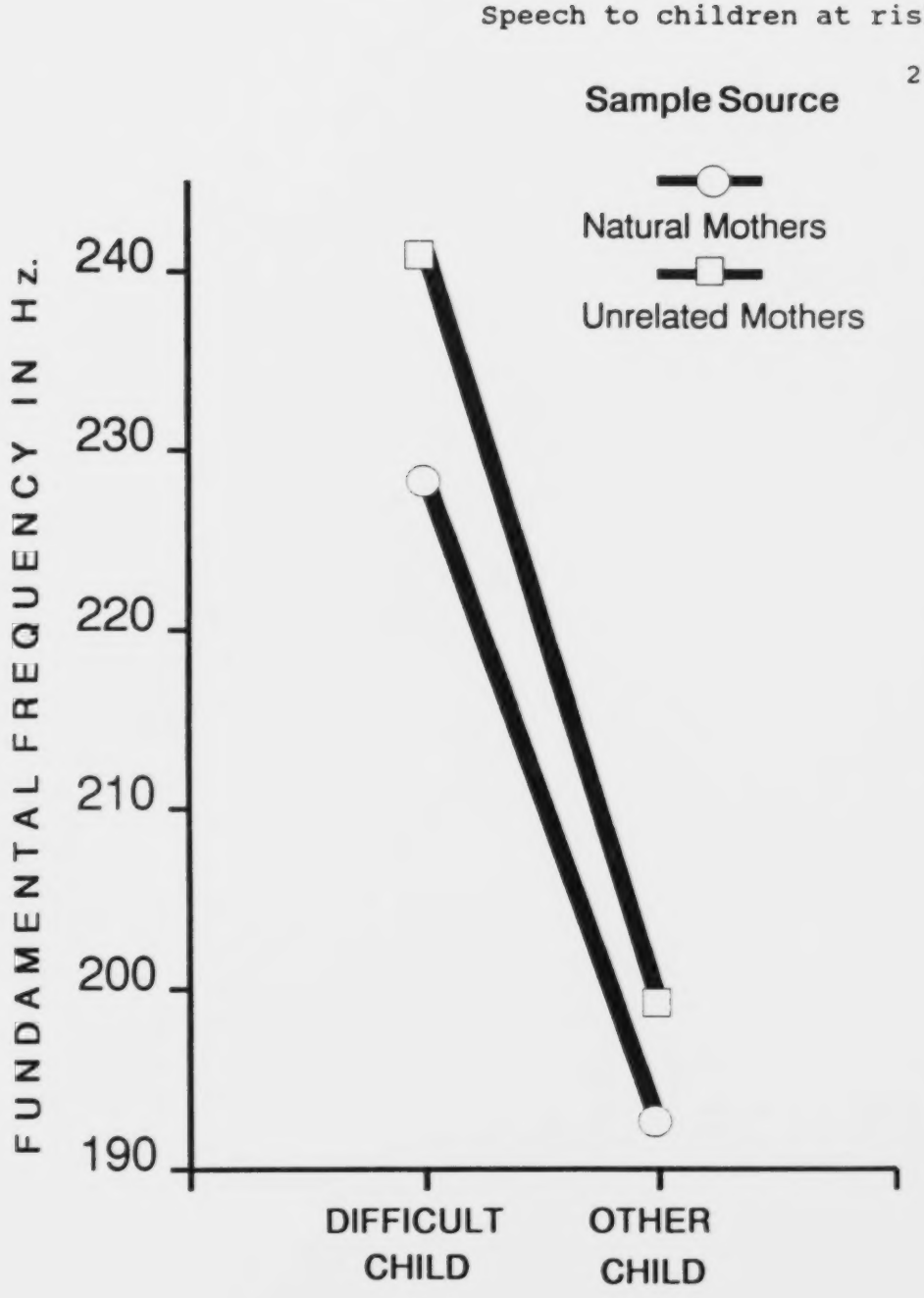

Fig. 1:Mean Fundamental Frequency in Speech samples to children at risk

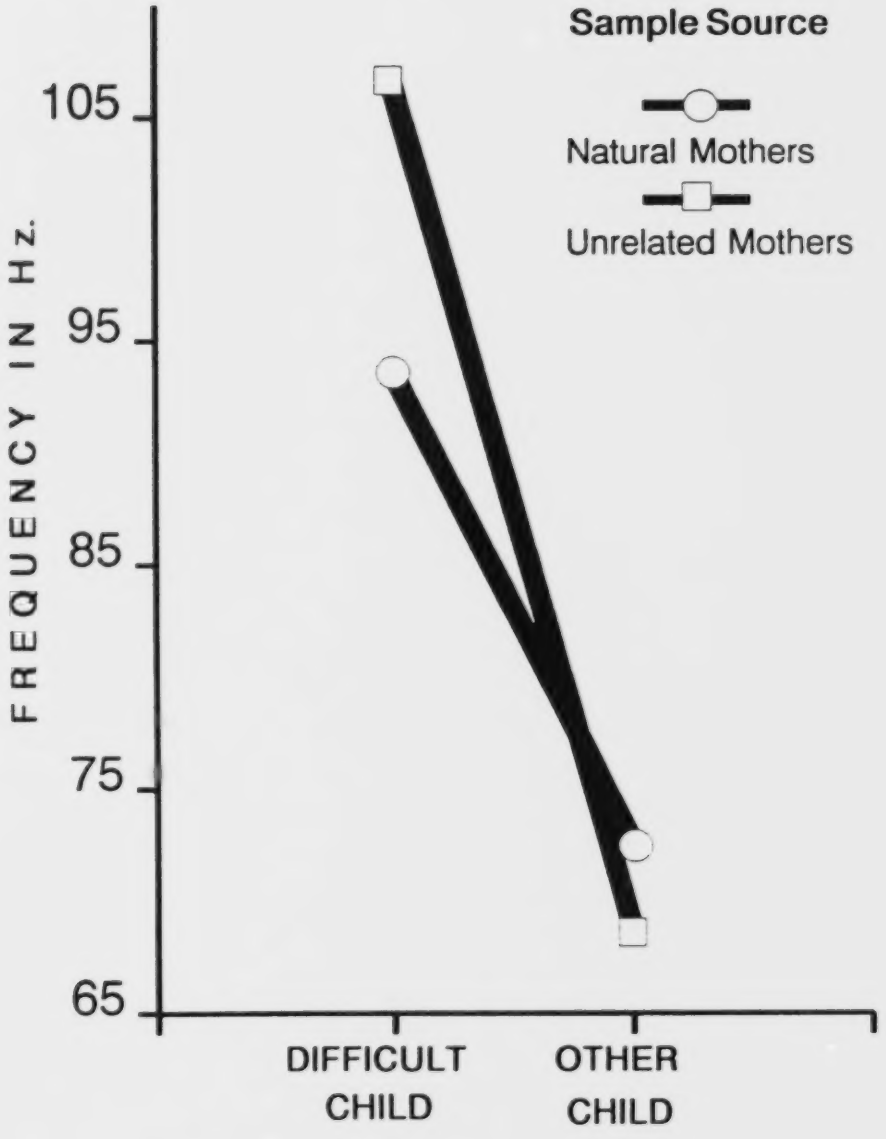

Fig. 2:Range of Fundamental Frequency in speech samples to children at risk

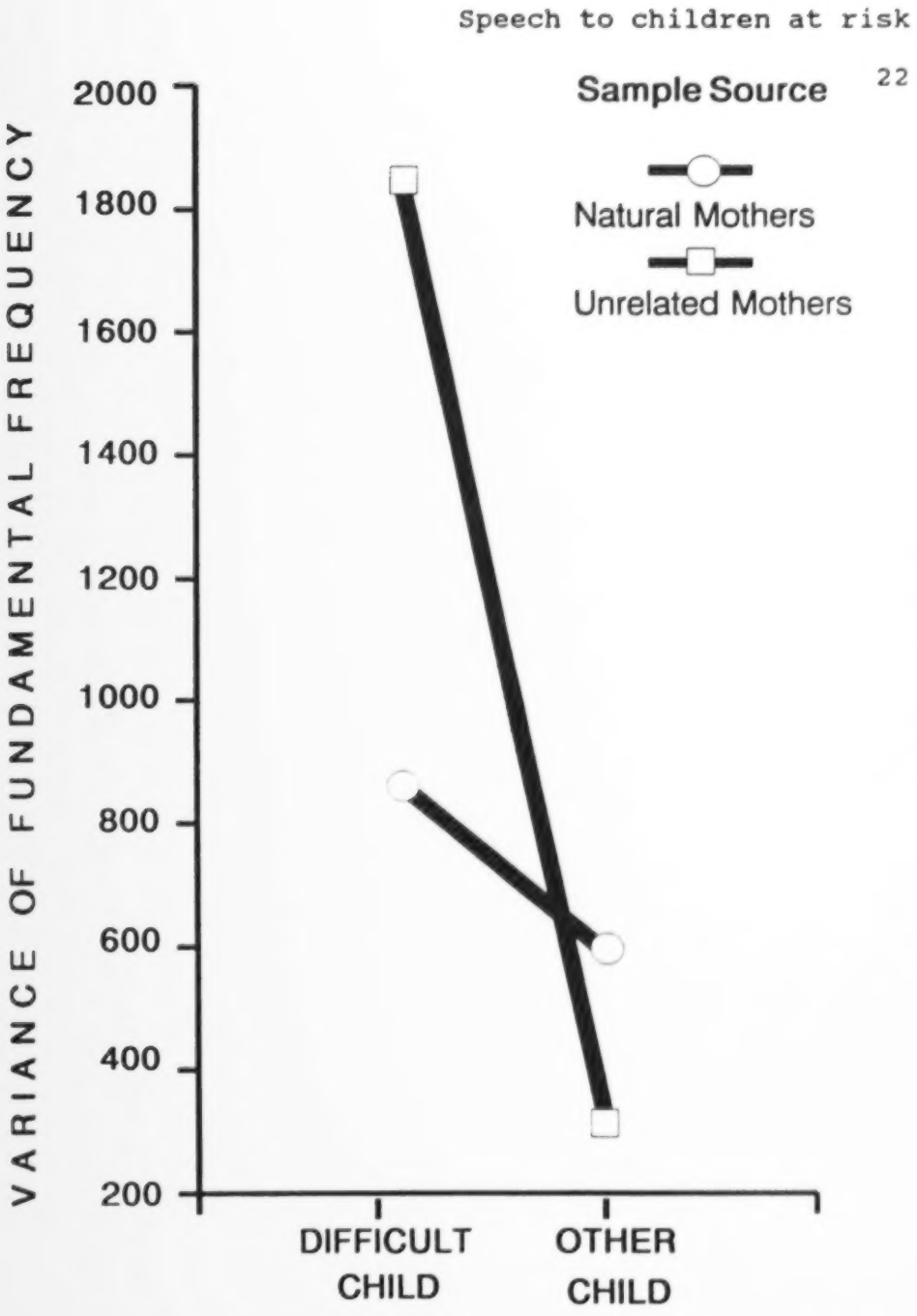

Fig. 3:Fundamental Frequency Variability in speech samples to children at risk